A 40 year simulation @0.2 degrees

for examining the spectral characteristics of the global ocean's physical domain with a NEP focus

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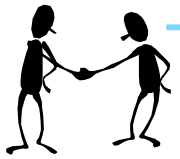
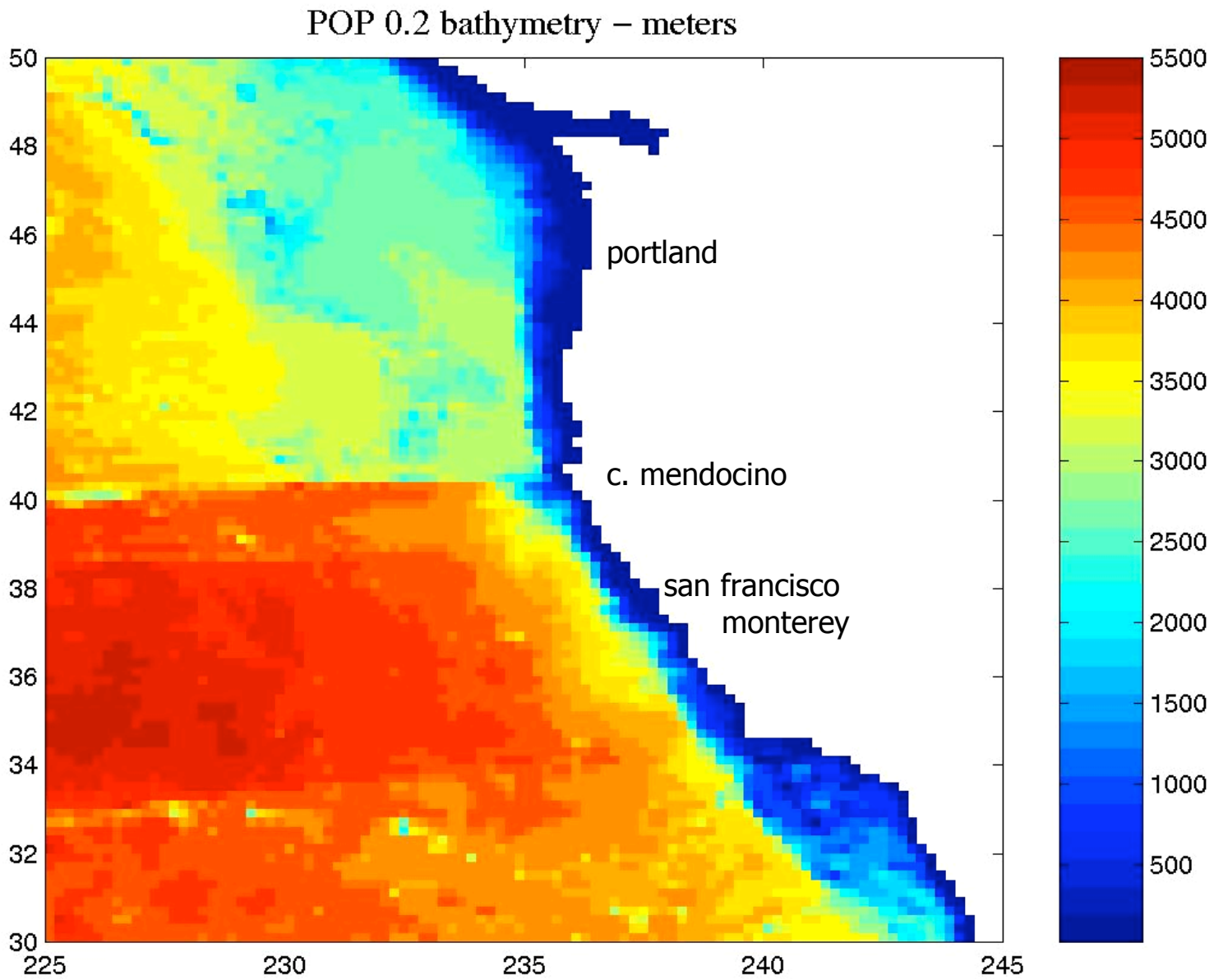
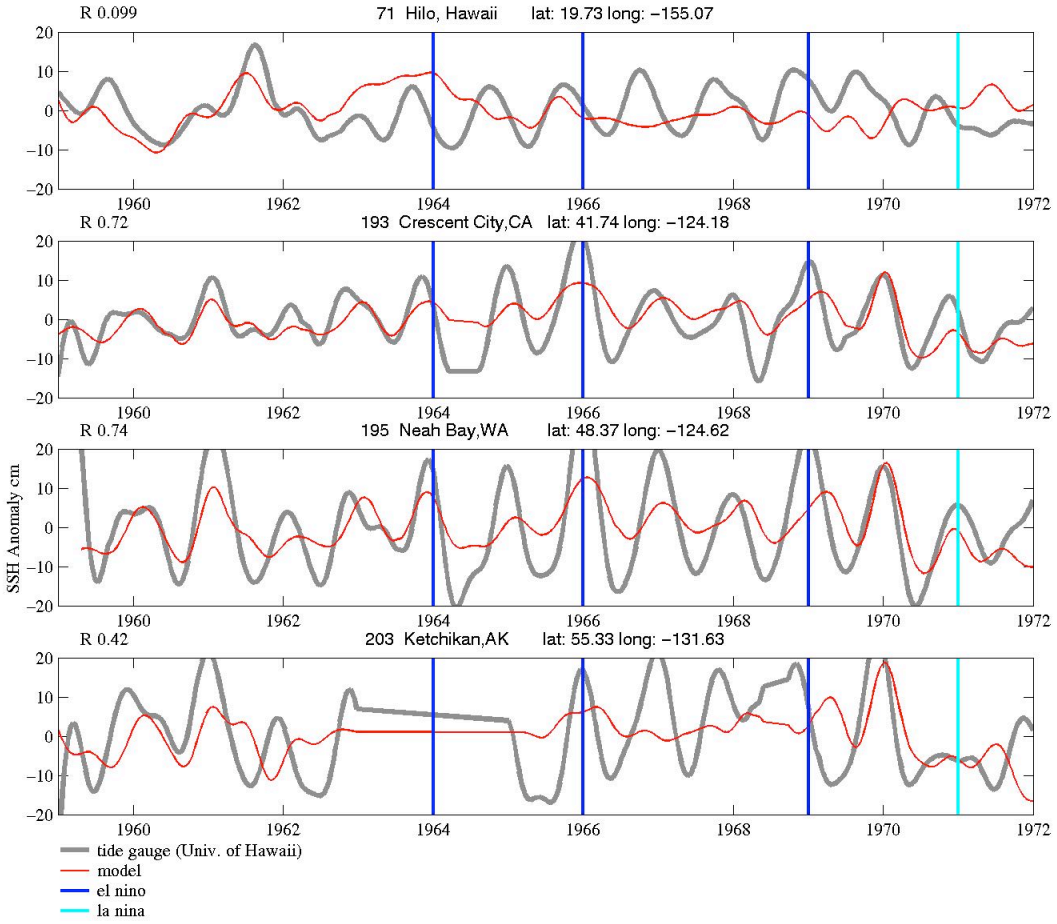
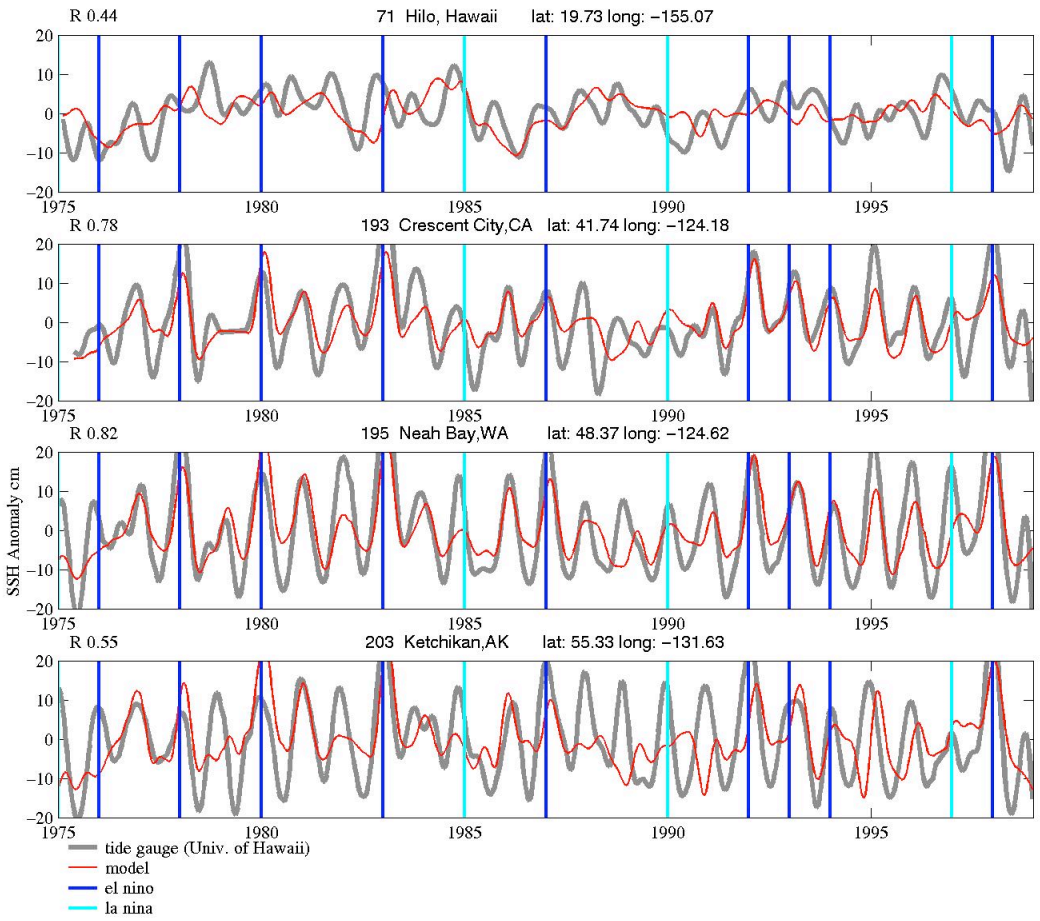
- Primitive equation model **POP** formulation [*Dukowicz and Smith, 1994*] - **GLOBAL** simulation
- **40 levels** in the vertical - 14 in the top 200m; 9 in the top 100m
- Implicit **free surface**
- **Bathymetry:** *Smith and Sandwell [1997*], International Bathymetric Chart of the Arctic Ocean [IBCAO, *Jakobsson et al., 2000],* and British Antarctic Survey (BEDMAP)
- **Forcing: Daily** National Center for Environmental Prediction (NCEP) fluxes for **1959-1998**; combination of daily NCEP analyses, monthly Internal Satellite Cloud Climatology Project (ISCCP) radiation data, and monthly Microwave Sounding Unit (MSU) and Xie-Arkin precipitation data
- **Mixed layer** formulation, K-Profile Parameterization (KPP) *Large et al. [1994]*
- Prognostic variables **(u,v,w,t,s,ssh) stored** every **10** days

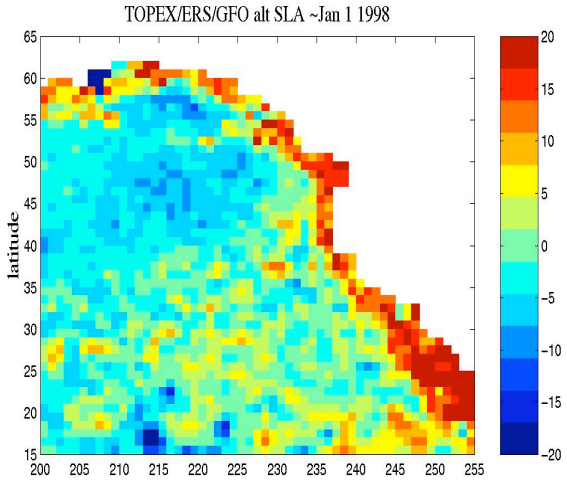


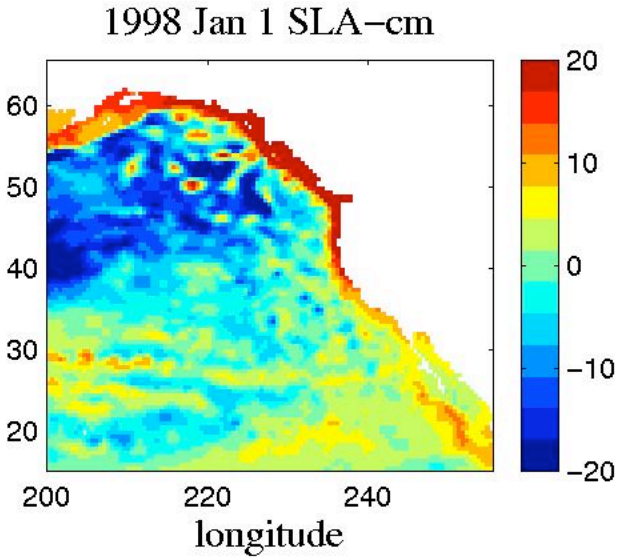
Acknowledgements: *NOAA/NSF GLOBEC NEP project (Co-I w/Murphree); Dept. of Energy, Climate Change Prediction Program (Co-I w/ Semtner), NCAR for computing resources*

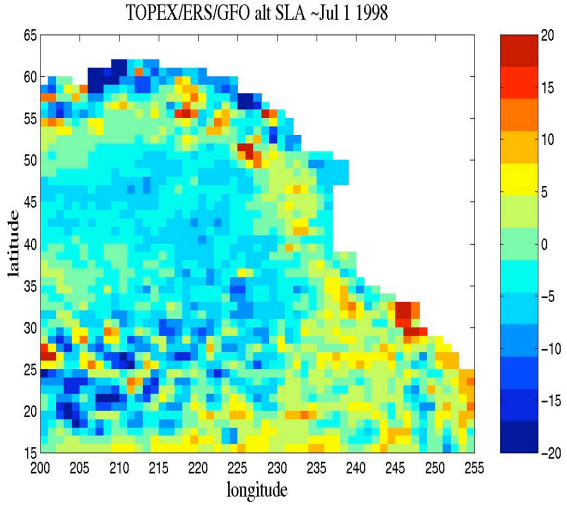

POP 0.2 bathymetry – meters
portland
c. mendocino
san francisco
monterey
50
48
46
44
42
40
38
36
34
32
30
225
230
235
240
245
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500

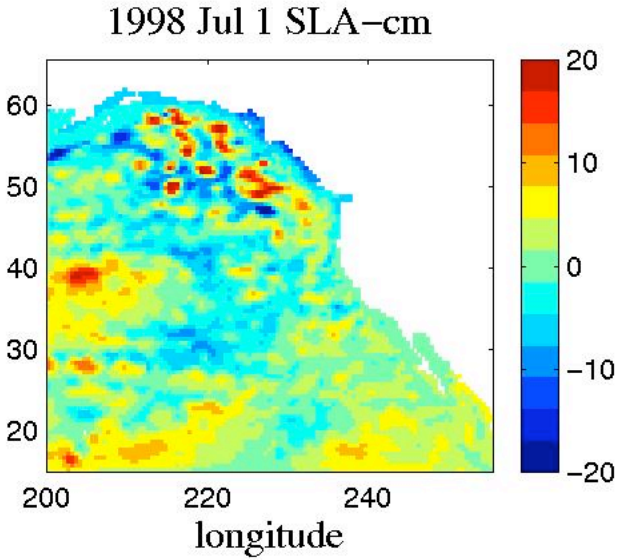

R 0.099
71 Hilo, Hawaii lat: 19.73 long: −155.07
R 0.72
193 Crescent City,CA lat: 41.74 long: −124.18
R 0.74
195 Neah Bay,WA lat: 48.37 long: −124.62
R 0.42
203 Ketchikan,AK lat: 55.33 long: −131.63
SSH Anomaly cm
20
10
0
−10
−20
1960
1962
1964
1966
1968
1970
1972
tide gauge (Univ. of Hawaii)
model
el nino
la nina

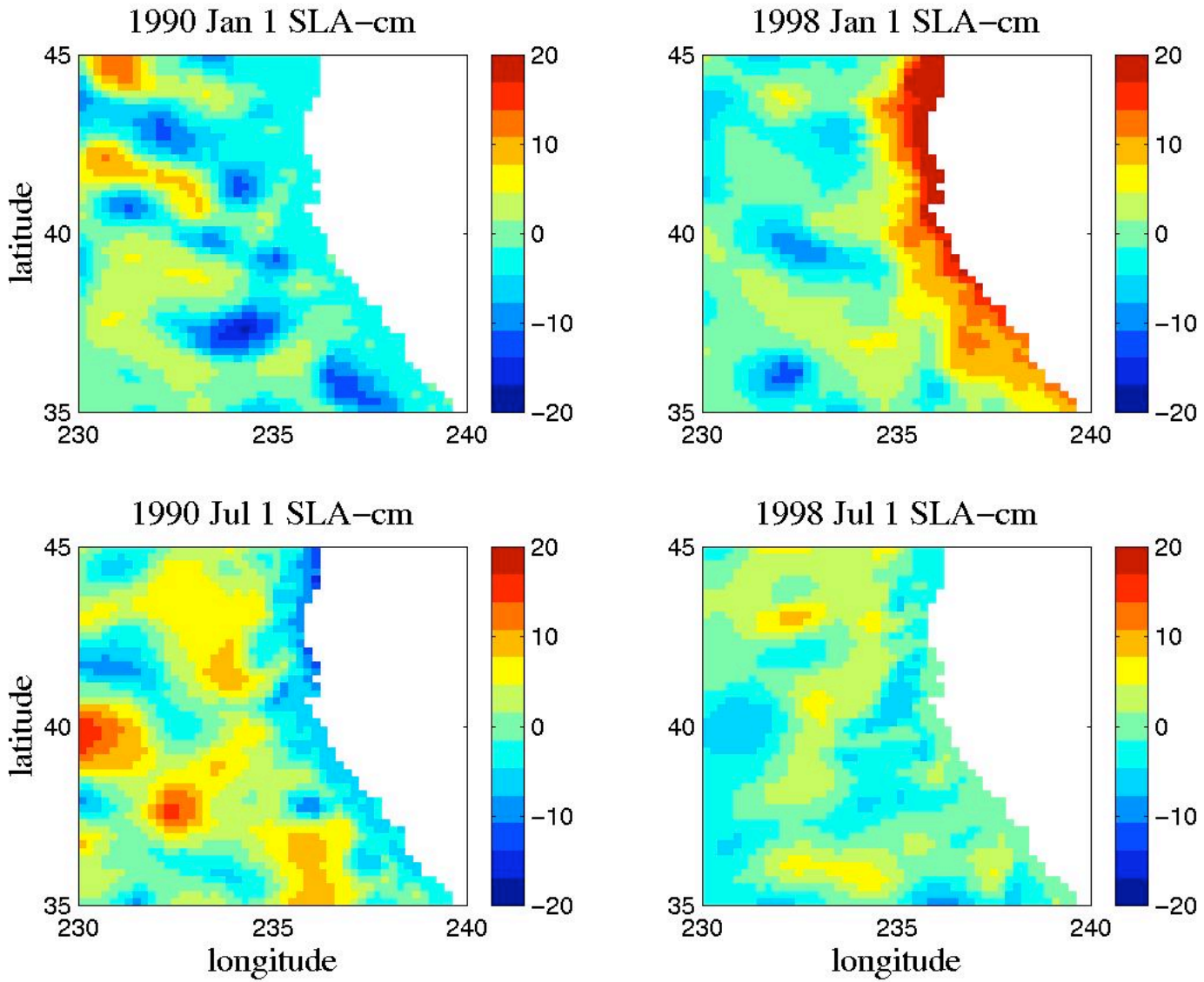

R 0.44
71 Hilo, Hawaii lat: 19.73 long: −155.07
R 0.78
193 Crescent City,CA lat: 41.74 long: −124.18
R 0.82
195 Neah Bay,WA lat: 48.37 long: −124.62
R 0.55
203 Ketchikan,AK lat: 55.33 long: −131.63
SSH Anomaly cm
20
10
0
−10
−20
1975
1980
1985
1990
1995
tide gauge (Univ. of Hawaii)
model
el nino
la nina

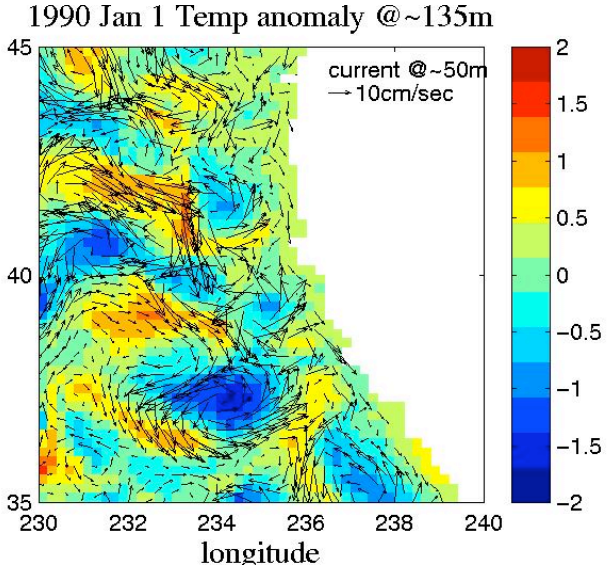

TOPEX/ERS/GFO alt SLA ~Jan 1 1998
latitude
65
60
55
50
45
40
35
30
25
20
15
200 205 210 215 220 225 230 235 240 245 250 255
20
15
10
5
0
−5
−10
−15
−20

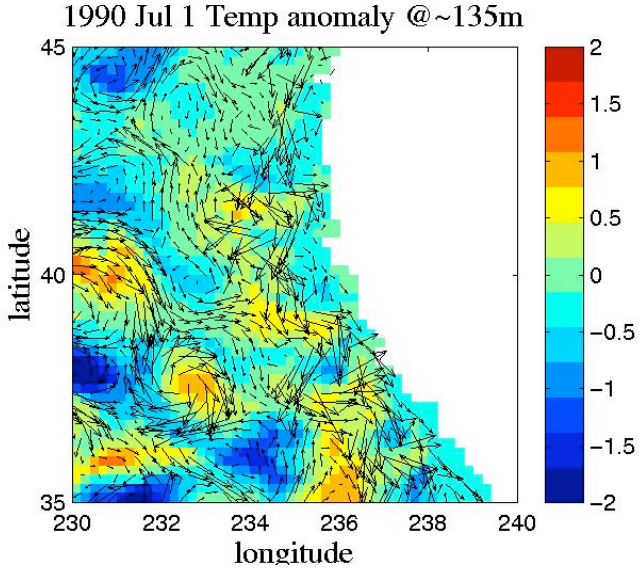

1998 Jan 1 SLA−cm
60
50
40
30
20
200 220 240
longitude
20
10
0
−10
−20

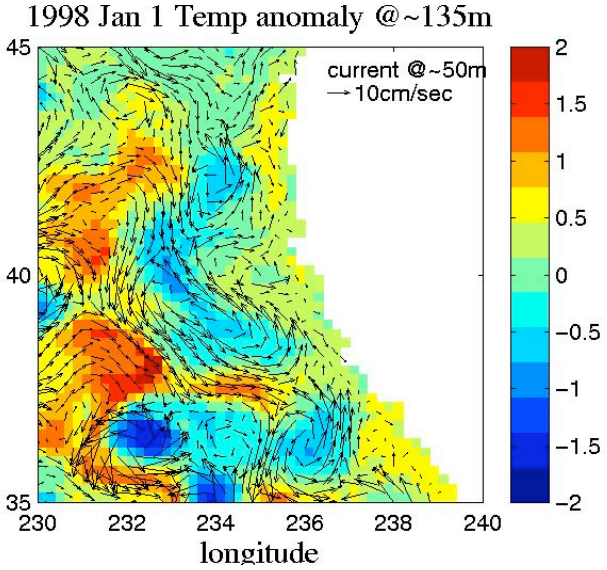

TOPEX/ERS/GFO alt SLA ~Jul 1 1998
latitude
65
60
55
50
45
40
35
30
25
20
15
200 205 210 215 220 225 230 235 240 245 250 255
longitude
20
15
10
5
0
−5
−10
−15
−20


1998 Jul 1 SLA−cm
60
50
40
30
20
200 220 240
longitude
20
10
0
−10
−20


1990 Jan 1 SLA−cm
1998 Jan 1 SLA−cm
1990 Jul 1 SLA−cm
1998 Jul 1 SLA−cm
latitude
longitude
45
40
35
230
235
240
20
10
0
−10
−20


1990 Jan 1 Temp anomaly @~135m
current @~50m
10cm/sec
45
40
35
230
232
234
236
238
240
longitude
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2


1990 Jul 1 Temp anomaly @~135m
latitude
45
40
35
230
232
234
236
238
240
longitude
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2


1998 Jan 1 Temp anomaly @~135m
current @~50m
10cm/sec
45
40
35
230
232
234
236
238
240
longitude
2
1.5
1
0.5
0
−0.5
−1
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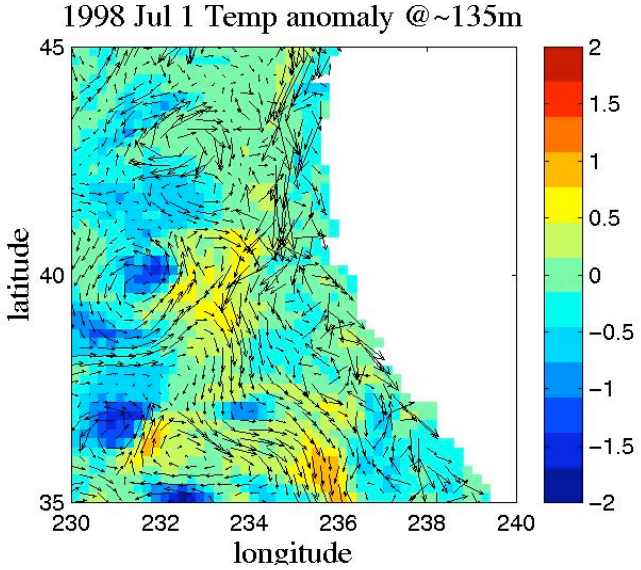
1998 Jul 1 Temp anomaly @~135m
latitude
45
40
35
230
232
234
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longitude
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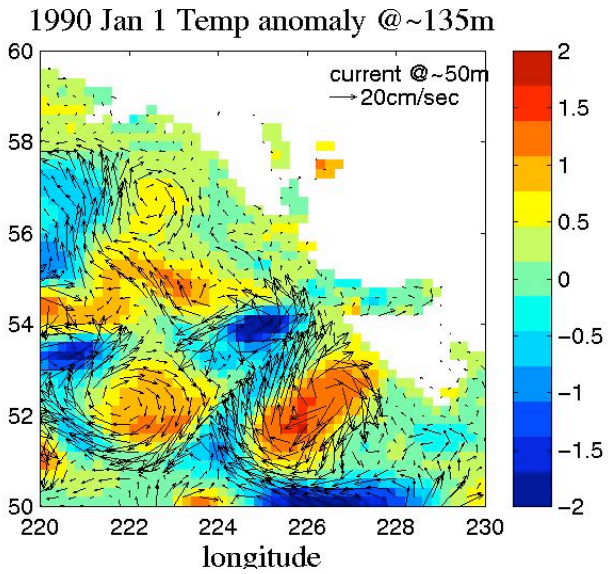
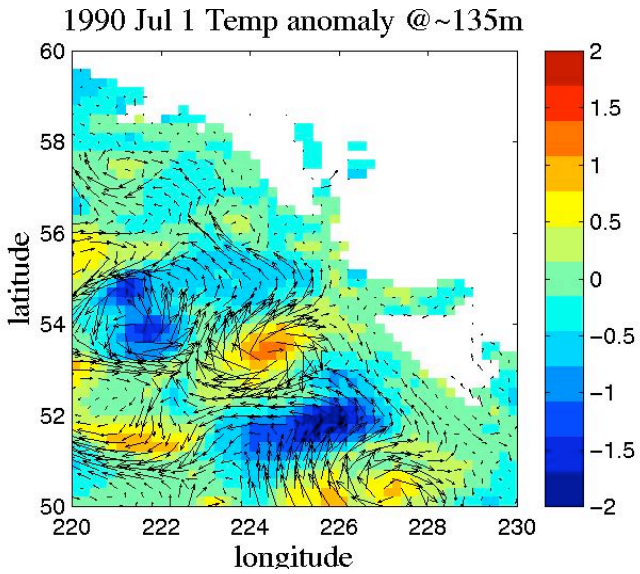

1990 Jan 1 Temp anomaly @~135m
current @~50m
20cm/sec
60
58
56
54
52
50
220
222
224
226
228
230
longitude
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2


1990 Jul 1 Temp anomaly @~135m
latitude
60
58
56
54
52
50
220
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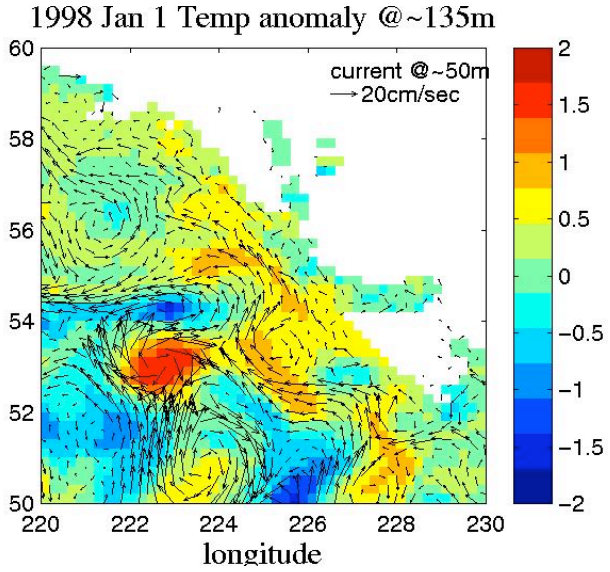
224
226
228
230
longitude
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2


1998 Jan 1 Temp anomaly @~135m
current @~50m
20cm/sec
60
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52
50
220
222
224
226
228
230
longitude
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−0.5
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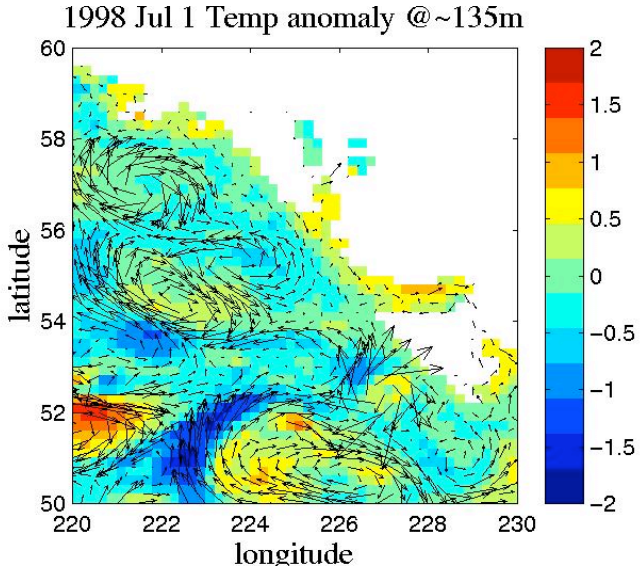
1998 Jul 1 Temp anomaly @~135m
latitude
60
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56
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52
50
220
222
224
226
228
230
longitude
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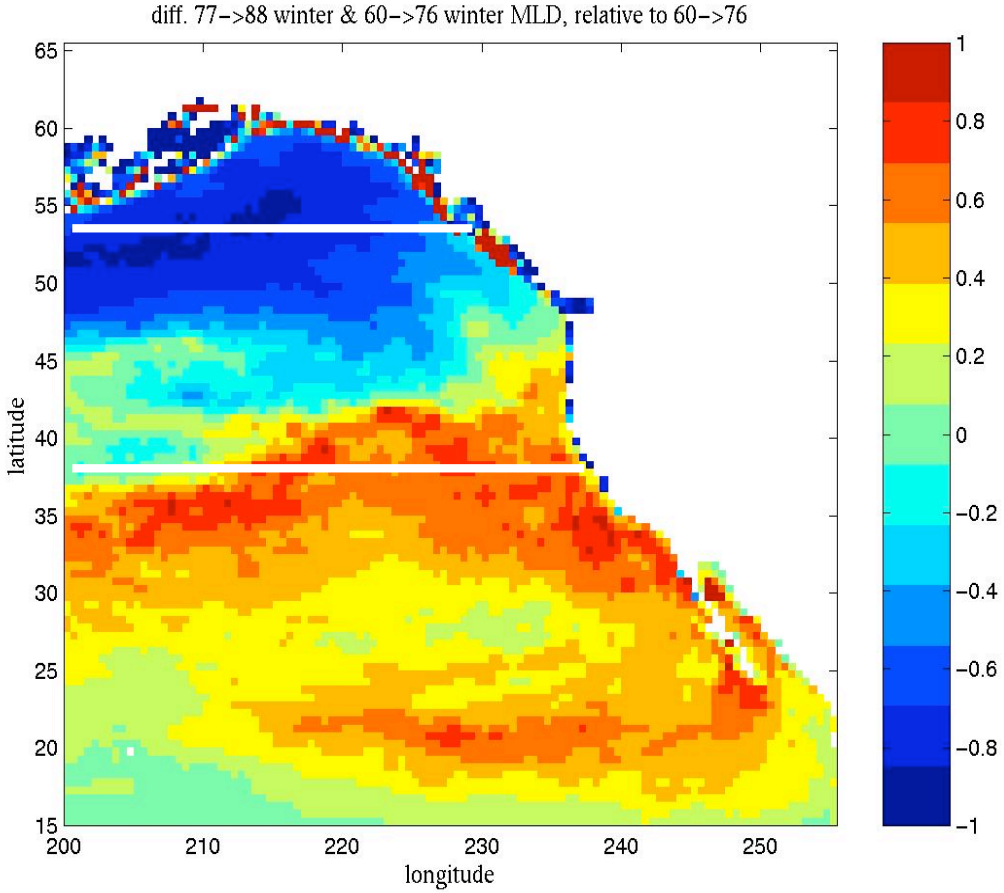
1
0.5
0
−0.5
−1
−1.5
−2



Polovina et al., 1994

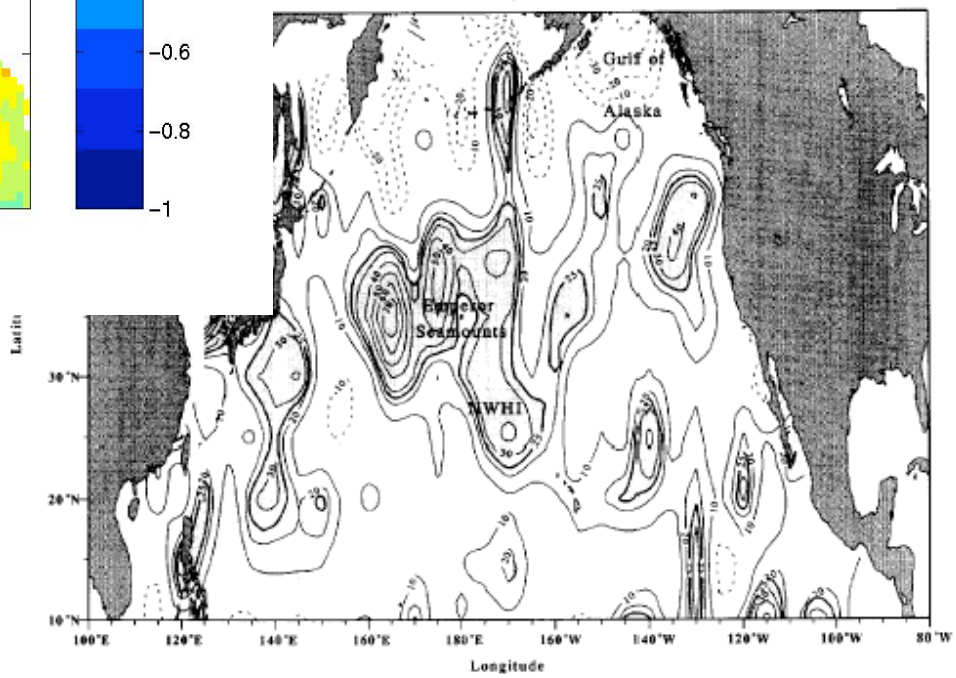
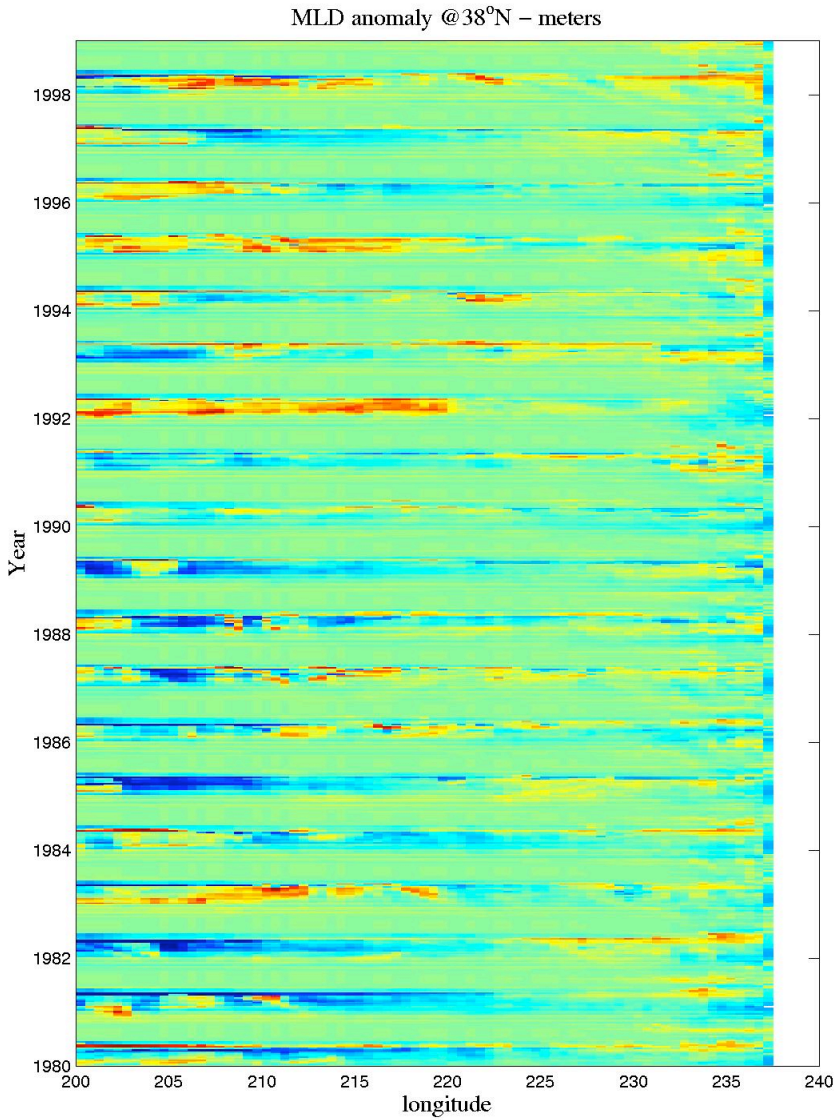
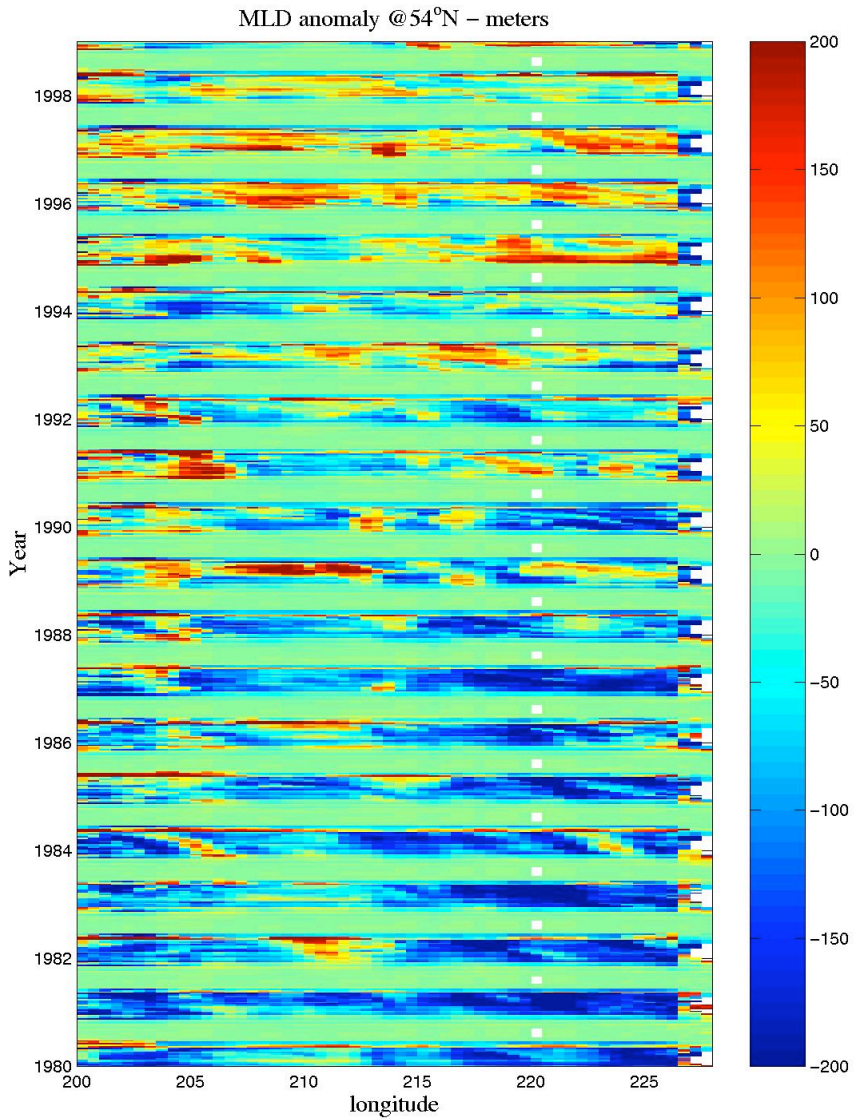
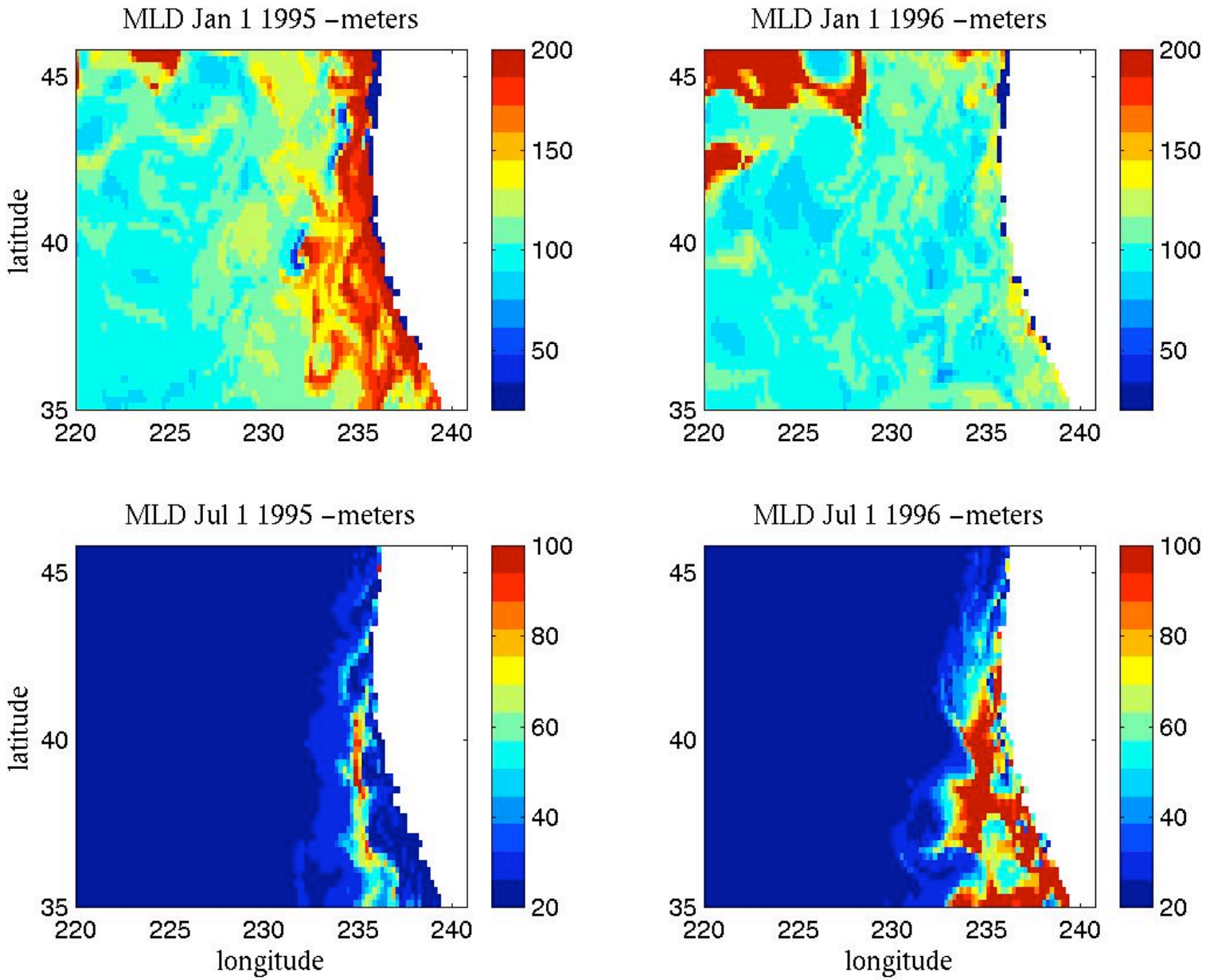
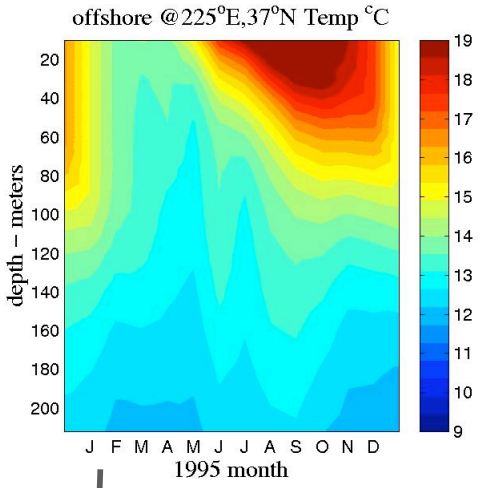


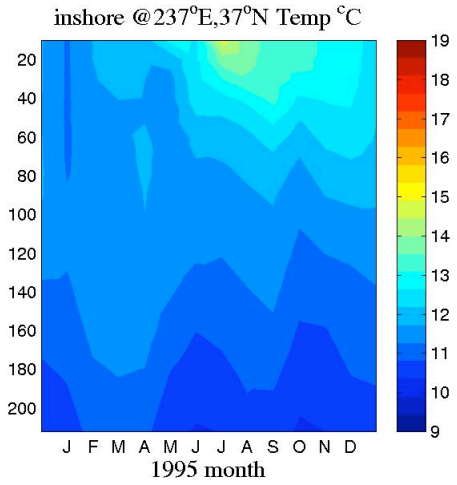
Fig. 3. Percent change in mean winter and spring MLD between 1977–88 and 1960–76 relative to 1960–76 levels. Shading for 1977–88 MLD which are more than 25% deeper than 1960–76 MLD. Dashed contours are negative values.

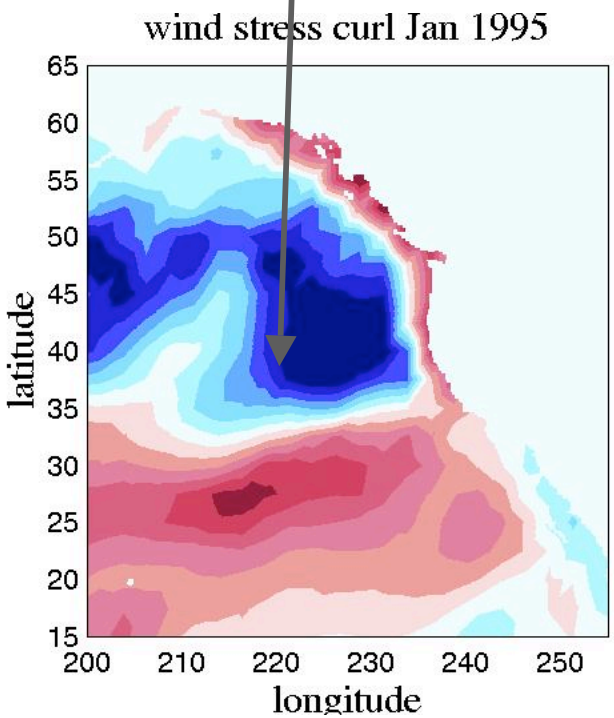

MLD anomaly @38°N – meters
Year
1998
1996
1994
1992
1990
1988
1986
1984
1982
1980
200
205
210
215
220
225
230
235
240
longitude

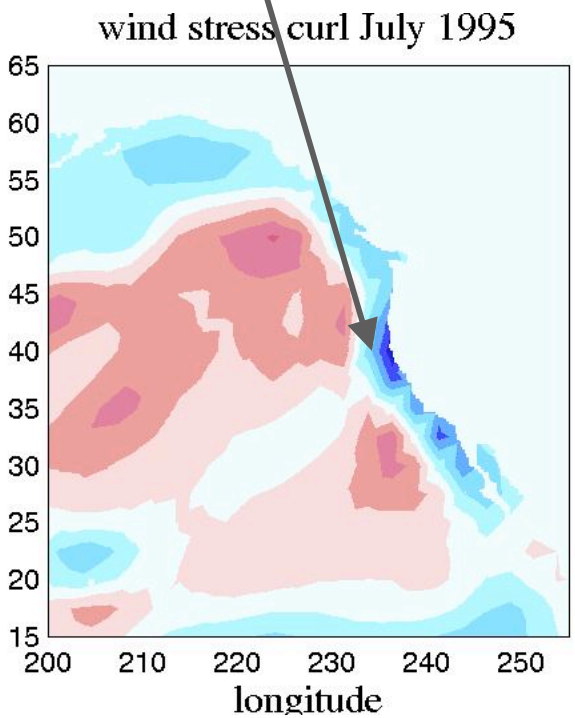

MLD anomaly @54°N – meters
Year
1998
1996
1994
1992
1990
1988
1986
1984
1982
1980
200
205
210
215
220
225
longitude
200
150
100
50
0
−50
−100
−150
−200


MLD Jan 1 1995 –meters
MLD Jan 1 1996 –meters
MLD Jul 1 1995 –meters
MLD Jul 1 1996 –meters
latitude
longitude
45
40
35
220
225
230
235
240
200
150
100
50
80
60
20









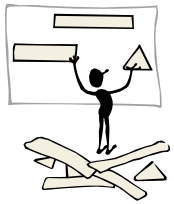
Pink ==NEG

Blue ==POS

SUMMARY

•POP 40 year simulation at 0.2° **reproduces weekly to decadal signals reasonably well**

•Spatially, simulation shows **rich, fine structure in the MLD, T,S, and currents**



•**Additional analyses** to understand complex spatial and temporal variability that impacts biological production regimes.

•Make most **fields available to community** in an easy-to-handle format (Live access)

•Look for information about accessing fields **end of March** timeframe at http://www.oc.nps.navy.mil/~rtt

•Run **simuation** through to **end of 2002**

THANK YOU for your attention